SUMMARY OF FECAL-COLIFORM BACTERIA CONCENTRATIONS IN STREAMS OF THE CHATTAHOOCHEE RIVER NATIONAL RECREATION AREA, METROPOLITAN ATLANTA, GEORGIA, MAY-OCTOBER 1994 AND 1995

by M. Brian Gregory[1/] and Elizabeth A. Frick[2/]

AUTHORS: [1/] Ecologist, [2/]Hydrologist, U.S. Geological Survey, 3039 Amwiler Road, Suite 130, Peachtree Business Center, Atlanta, GA 30360-2824.

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Abstract. As part of a 2-year U.S. Geological Survey (USGS) and National Park Service (NPS) project to better define microbial contamination in and near the Chattahoochee River National Recreation Area (CRNRA), the USGS analyzed fecal-coliform bacteria data collected from May to October of 1994 and 1995, by the Georgia Environmental Protection Division. This data set included 14 Chattahoochee River and 22 tributary stream sites in the vicinity of the CRNRA and the reach of the Chattahoochee River downstream of the CRNRA and Metropolitan Atlanta. This paper summarizes the distribution and occurrence of fecal-coliform bacteria concentrations based on these data and is a condensed version of a USGS and NPS publication by Gregory and Frick (2000).

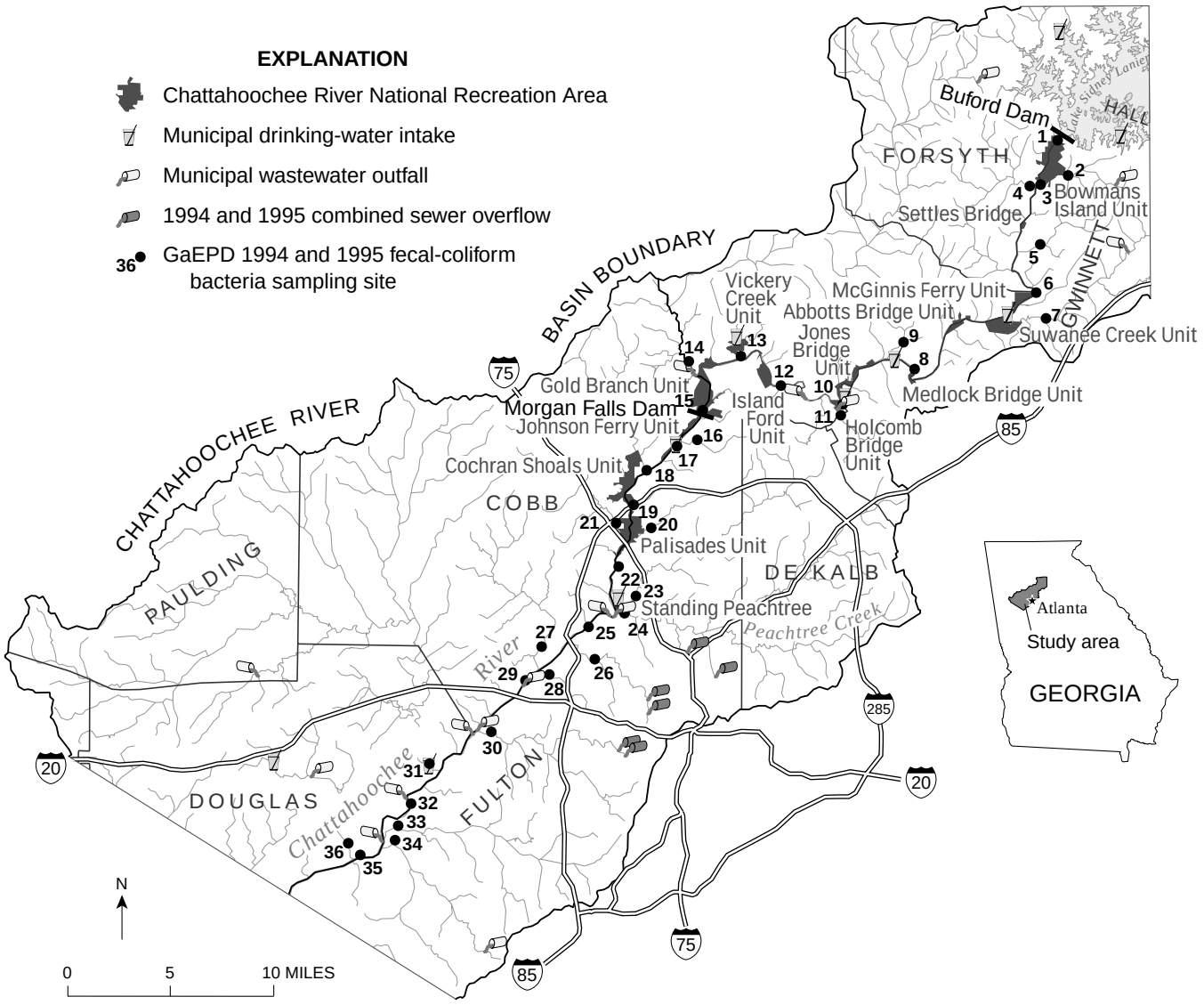
INTRODUCTION

The Chattahoochee River is the most utilized water resource in Georgia. The rapid growth of Metropolitan Atlanta and its location downstream of the headwaters of the drainage basin make the Chattahoochee River an important resource for drinking-water supplies, recreation, and wastewater assimilation (fig. 1). The CRNRA was created by the U.S Congress in 1978 and contains about three-fourths of all public green space in the 10-county area of Metropolitan Atlanta (Kunkle and Vana-Miller, 2000). The CRNRA attracted about 2.9 million visitors in 1999, with nearly 30 percent of the visitors participating in water-based activities (William J. Carroll, National Park Service, oral commun., 2000).

During 1994 and 1995, elevated concentrations of fecal-coliform bacteria were the most common reason that the Chattahoochee River and its tributaries did not meet designated uses of drinking-water supply, recreation, and fishing. According to the Georgia Department of Natural Resources (1997), during 1994 and 1995, 67 of 77 stream reaches assessed in Metropolitan Atlanta did not meet or only partially met water-quality requirements for designated uses. High concentrations of fecal-coliform bacteria were a contributing factor in ninety-four percent (63 of the 67) of stream reaches that did not meet or only partially met designated uses. Although the presence of indicator bacteria does not prove that disease-causing bacteria, viruses, or protozoa are present in the environment, their presence does show that contamination by fecal material has occurred. High concentrations of fecal-coliform bacteria have the potential to reduce the recreational value of the Chattahoochee River by posing an increased risk of exposure to harmful bacteria and the associated adverse effects to humans who come in contact with the water.

Data Collection

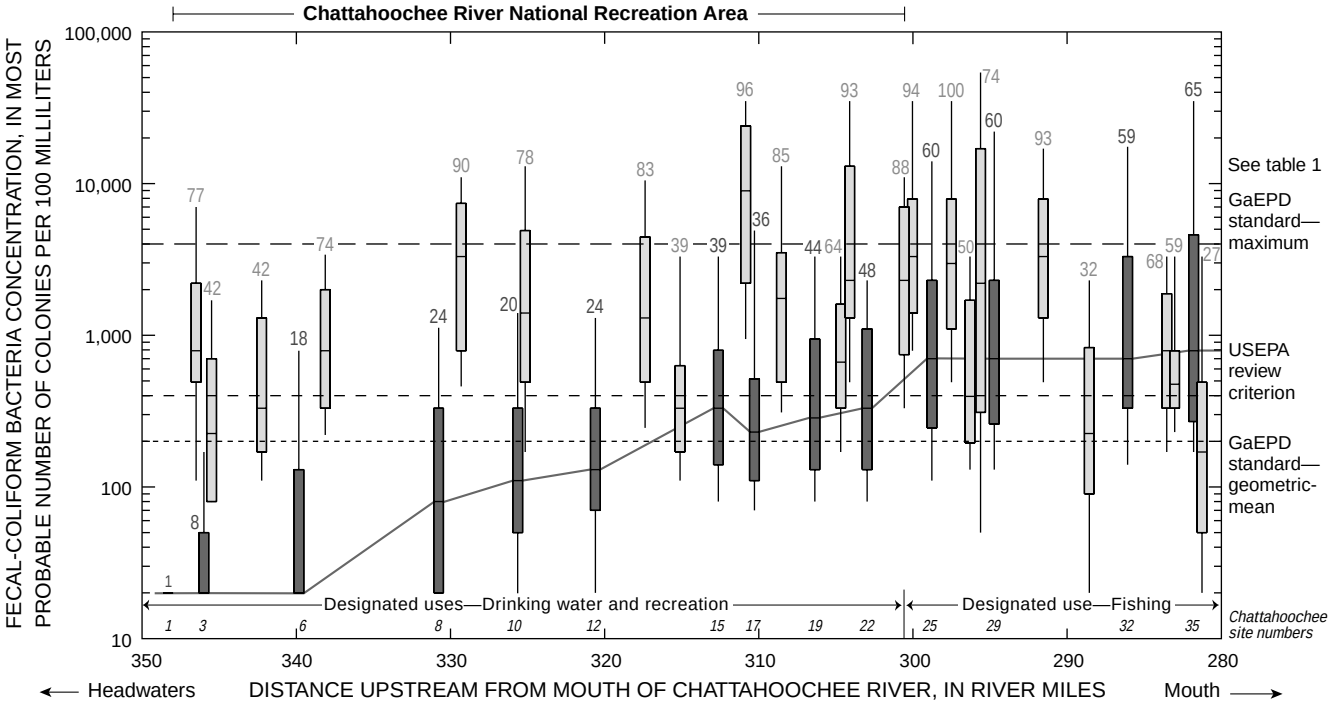
The Georgia Environmental Protection Division (GaEPD) collected a spatially extensive water-quality data set from May to October in 1994 and 1995 as part of their Chattahoochee River Modeling Project (Georgia Department of Natural Resources, 1994a). Water-quality samples consisted of single grab samples collected midstream at 14 Chattahoochee River and 22 tributary stream sites in the vicinity of and immediately downstream of the CRNRA (fig. 1). Fecal-coliform bacteria concentrations were determined using the Multiple Tube Fermentation Technique (American Public Health Association and others, 1985) and expressed as the Most Probable Number of fecal-coliform colony forming units per 100 milliliters (MPN col/100 mL). As part of a 2-year USGS and NPS project to better define microbial contamination in and near the CRNRA, the USGS analyzed these historical data.



Georgia Environmental Protection Division (GaEPD) 1994 and 1995 fecal-coliform bacteria sampling sites within the study area

Site number	Site name
1	Chattahoochee River—Buford Dam tailwater near Buford
2	Richland Creek
3	Chattahoochee River—State Road 20 near Suwanee
4	James Creek
5	Level Creek
6	Chattahoochee River—McGinnis Ferry Road at Suwanee
7	Suwanee Creek
8	Chattahoochee River—Medlock Bridge Road near Norcross
9	Johns Creek
10	Chattahoochee River—Holcomb Bridge Road near Norcross
11	Crooked Creek
12	Chattahoochee River—Eves Road above Roswell
13	Big Creek
14	Willeo Creek
15	Chattahoochee River—Morgan Falls Dam Forebay at Sandy Springs
16	Marsh Creek
17	Chattahoochee River— Johnson Ferry Road near Atlanta
18	Sope Creek
19	Chattahoochee River—Powers Ferry Road & I-285 near Atlanta
20	Long Island Creek
21	Rottenwood Creek
22	Chattahoochee River—Paces Ferry Road at Atlanta
23	Nancy Creek
24	Peachtree Creek
25	Chattahoochee River—South Cobb Drive near Atlanta
26	Proctor Creek
27	Nickajack Creek
28	Sandy Creek
29	Chattahoochee River—Martin Luther King Jr. Blvd. near Mabelton
30	Utoy Creek
31	Sweetwater Creek
32	Chattahoochee River—State Road 166 near Ben Hill
33	Camp Creek
34	Deep Creek
35	Chattahoochee River—State Road 92 near Fairburn
36	Anneewakee Creek

Figure 1. Location of the Chattahoochee River National Recreation Area and Georgia Environmental Protection Division fecal-coliform bacteria sampling sites in the study area, May–October 1994 and 1995.



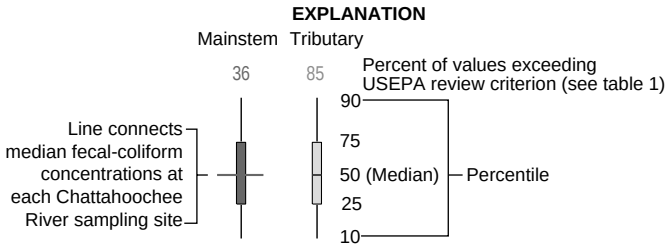


Figure 2. Fecal-coliform bacteria concentrations in the Chattahoochee River and tributary streams, Metropolitan Atlanta, May–October 1994 and 1995 (data from Georgia Environmental Protection Division).

Table 1. Georgia Environmental Protection Division (GaEPD) fecal-coliform bacteria standards and U.S. Environmental Protection Agency (USEPA) review criterion

[All standards and criterion are in Most Probable Number of colonies per 100 milliliters (MPN col/100 mL); —, no standard or criterion. Modified from Georgia Department of Natural Resources, 1994b]

Designated use	Time of year that standards and criterion apply	GaEPD standards		USEPA (1997) recommended review criterion to evaluate once-per-month samples[2]
		30-day geometric mean[1]	Maximum single sample[2]	
Drinking-water supply	May–October[3]	200	—	400
	November–April	1,000	4,000	—
Recreation	Year round	200	—	400
Fishing	May–October[3]	200	—	400
	November–April	1,000	4,000	—

[1/] Based on at least four samples collected from a given site over a 30-day period at an interval not less than 24 hours. The geometric mean of a series of N terms is the N^{th} root of their product. For example, the geometric mean of 2 and 18 is 6—the square root of 36.

[2/] Waters are deemed **not supporting** designated uses (impaired) when 25 percent or more of the samples have fecal-coliform bacteria concentrations greater than the applicable review criterion or standard (400 or 4,000 MPN col/100 mL) and **partially supporting** when 11 to 25 percent of the samples exceed the review criterion or standard.

[3/] May–October is defined as the summer recreation season—the season when most water-contact activities are expected to occur. The State of Georgia does not encourage swimming in any natural surface waters because a number of factors beyond the control of any State agency contribute to elevated concentrations of fecal-coliform bacteria.

RESULTS

During the 1994 and 1995 summer recreational seasons, fecal-coliform bacteria concentrations in the Chattahoochee River were lowest downstream from Buford Dam—especially nearest the dam—because of dilution from water released from near the bottom of Lake Sidney Lanier. Median fecal-coliform bacteria concentrations in the Chattahoochee River increased steadily from less than 20 MPN col/100 mL in the tailwaters of Buford Dam on Lake Sidney Lanier to 790 MPN col/100 mL downstream of Metropolitan Atlanta (fig. 2). During the 1994 and 1995 summer recreational seasons, from 27 to 100 percent of samples collected at 22 tributary stream-monitoring sites exceeded the U.S. Environmental Protection Agency (USEPA) review criterion of 400 col/100 mL and from 1 to 65 percent of samples collected at 14 Chattahoochee River monitoring sites also exceeded this criterion (fig. 2; table 1). GaEPD standards and the USEPA review criterion for fecal-coliform bacteria (table 1) were commonly exceeded during wet-weather conditions in most Metropolitan Atlanta tributary streams and during most streamflow conditions in several tributaries that drain areas dominated by urban and suburban land uses.

OVERVIEW

Although concentrations of fecal-coliform bacteria that exceed GaEPD standards and the USEPA review criterion are common in Metropolitan Atlanta streams, this situation is not unique to the Metropolitan Atlanta area. According to a recent nationwide study, bacterial contamination was ranked as the third most common cause for water-body impairment in the United States during 1996 (Armitage and others, 1999). Whereas waterborne diseases were once a greater threat to human health in the United States, currently the threat of waterborne disease exists for humans living in densely populated areas (Burke, 1993). These risks have the potential to be even greater in areas where under-treated or untreated wastewater effluent and runoff from highly urbanized areas contribute to drinking-water-source supply intakes, or where recreational contact with contaminated water may occur.

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